

Managing Food Allergies in Schools

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Abstract Food allergies are estimated to affect as many as 8 % of children with 2.5 % being allergic to peanut products. Based on the results of recent surveys, this prevalence has been increasing over the last few decades for unknown reasons. As children with food allergies reach school age, the issue is becoming more common in schools. For that reason, schools are now required to be prepared to take responsibility for the safety of food-allergic students. This review discusses the common problems surrounding management of food allergies in the school setting along with reasonable recommendations for addressing those problems. The most important component of food allergy management is for the student to get an accurate diagnosis and to then discuss development of an anaphylaxis action plan with their health-care provider. Each school should insist that a copy of such a plan be provided for each student with food allergy and that epinephrine is readily available should a student have an anaphylactic reaction. In addition to epinephrine, it is essential that school personnel be properly trained to recognize and treat allergic reactions should they occur. Known deficiencies in school preparedness have been documented in previous literature, and consequently, both state and the federal government have begun to implement policies to help with school preparedness.

Keywords Food allergy · School · Anaphylaxis · Epinephrine

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Introduction

Food allergies affect 11 million Americans, including 6–8 % of children. Food allergy has become increasingly common during the last few decades and has doubled from 1997 to 2002 [1]. The prevalence of peanut allergy in Montreal in one survey was 1.50 % [2]. In a nationwide telephone survey of 400 elementary school nurses, 44 % reported an increase in children with food allergies in their schools over the last 5 years. One or more children with food allergies were reported in 97 % of responding schools in one survey conducted in Houston. Of children who have food allergy, 84 % will have a reaction in school, and 25 % have their first reaction to a food while at school [3].

Since there is no cure for food allergy, the approach to management is for the student to avoid the food of concern and to treat any reactions that do occur with epinephrine. This places a requirement on the schools to provide an environment in which students can avoid certain foods and where epinephrine is available and can be effectively administered should it be needed.

The most common foods that cause reactions in school age children include milk, egg, soy, wheat, and peanut. Peanut has become a particular concern because it has long been considered to be a staple of the elementary school child's diet and therefore is ubiquitous in American school cafeterias. The question of how to accommodate children who have a severe food allergy has created a great deal of concern in school districts across the country leading many states to develop specific food allergy policies. In this review, we will address the most salient and controversial issues that occur in schools and attempt to provide reasonable recommendations based on evidence from the medical literature.

Exposure Avoidance

Since there is no cure for food allergy, management consists primarily of avoidance of the offending food. This can only be

done if an accurate diagnosis of food allergy has been made and the food in question has been properly identified. Most schools require a physician diagnosis of food allergy with some type of note from a student's physician outlining which food(s) need to be avoided. In a telephone survey of the parents of 230 schoolchildren with reported food allergy, 85 % had consulted health-care professionals about their food allergy, and 68 % were physician-diagnosed as being allergic. Most of these had a history of respiratory symptoms or anaphylaxis. Children with milder symptoms were more likely to have not consulted with a physician [4]. Even so, the pediatric health-care provider delivers more than just an accurate diagnosis (which is important enough). They also can prescribe self-injectable epinephrine, teach the family how to store and use the medication and to implement prevention strategies, and work with schools to develop a written action plan [5].

Consultation with a health-care provider therefore is essential for students with a history of or concerns about food allergy. Because parents of children with food allergies are often frightened of the dangers their children may encounter when in the school environment, they often require support and affirmation [6]. A variety of organizations are available that can help such families including FARE (<http://www.foodallergy.org>), The Asthma and Allergy Foundation of America (<http://www.AAFA.org>), and The Allergy & Asthma Network/Mothers of Asthmatics (<http://www.AANMA.org>).

Food Provided by the School

Many students with food allergy prefer to eat food that is prepared and served at school. To do this, cafeteria personnel need to know which food(s) the student is allergic to so that foods that are free of the offending agent can be prepared and served to that student. For common foods such as peanut, it is feasible for schools to provide alternate choices. Students with multiple sensitivities pose a significant challenge since it may be difficult if not impossible for the school to prepare an adequate meal for them. Not only does the prepared food need to be devoid of the offending food, but reasonable efforts need to be made to avoid cross-contamination of utensils and cooking vessels, though perfect avoidance is not feasible. Food served at school could even be contaminated at the factory [7], though this is a rare occurrence and could also happen with food prepared at home. Schools that prepare food according to peanut-free guidelines, for example, do have a greater likelihood of successfully reducing exposure of allergic students to peanut [8].

Separate Tables During Meals

Some parents are concerned about the possibility of students sharing food and of food residue on tables and even on their

classmate's hands as a potentially dangerous source of exposure to food allergens. A common debate in schools, therefore, is whether children with food allergies need to sit at separate tables during school meals from those who do not have food allergy. One concern involves the possibility that food residue might be left on a shared table by a previous student. In addition, very young children might share food with each other leading to inadvertent ingestion of an undesired food.

This issue would be potentially manageable if there were only one food that causes allergies. Children with peanut allergy, for example, could be asked to sit with other children with that same allergy. Unfortunately, many children are allergic to other foods or to multiple foods raising the specter of schools having to set up multiple food-specific tables. Not only would this be logistically difficult, but it could lead to isolation during lunch of children who are sensitive to an uncommon food. The ultimate manifestation of this approach would be for food-allergic children to each sit at an isolated table to prevent any possibility of exposure to other children's food.

The real question is how much exposure to food residue does it take to cause a potentially dangerous allergic reaction? If food residue on tables fails to expose a child to sufficient food allergen to trigger a systemic reaction, the issue is moot. One study addressed this question by challenging 30 proven peanut-allergic children with peanut butter by applying it to their skin in a double-blind, placebo-controlled manner [9]. None of the patients experienced a systemic reaction though three had erythema at the site of application. These findings were confirmed in another study in which children who were skin-reactive and had a positive oral challenge to peanut had peanut applied to their skin for 15 min. None of the children and particularly none of those who developed erythema or even urticaria from this prolonged cutaneous exposure to peanut experienced a systemic reaction [10].

Given the lack of a systemic reaction in known peanut-sensitive children cutaneously exposed to peanut, it is highly unlikely that even less exposure, as would occur from invisible peanut residue on a table or other surface, places peanut-sensitive students at risk of anaphylaxis. The practice of providing separate tables therefore does not appear to be medically necessary.

For those schools that want to eliminate possible exposure to food residues, it is known that soaps and commercial cleaning products can remove such residue from surfaces. A study looking at the removal of Ara h1 from hands found that all soaps, except alcohol-based hand sanitizers, were effective in peanut protein removal [11].

Previous studies reporting reactions at schools found that more reactions occurred in the classroom during craft projects than in the lunchroom. Children in the US peanut and tree nut registry had a 79 % reported rate of reactions in the classroom during crafts projects [5].

Airborne Food Allergens?

Avoidance measures are occasionally driven by the concern that anaphylaxis may occur due to airborne exposure. This concern is manifested in many locations including restaurants where peanut shells are on the floor, sports events where peanuts are eaten, airplanes where peanuts are distributed to passengers, and of course, in schools where peanut butter is eaten. Previous literature has reported that peanuts and peanut butter at room temperature may have an aroma but that the vapor phase does not contain significant peanut protein. In one study, peanut butter held 12 inches from the face of peanut-allergic children for 10 min failed to elicit a reaction [9]. A reaction to odors is a neurologic response triggered by volatile organic compounds, and an allergic reaction is an immunologic response to proteins so this type of exposure does not place a student at risk of anaphylaxis [11].

To determine just how much airborne peanut allergen is present under various scenarios in one study, total peanut allergen as well as Ara h1 and Ara h2 were measured when removing shells of roasted peanuts as well as when bags of peanuts were opened, when peanut flour was poured from a cup, and when jars of peanut butter were opened. Peanut allergen was detected only when shells were being removed and also in the vapor when peanuts were being boiled, though the amount of allergen was near the level of detection for the assay. Exposure to bags of peanuts and peanut butter, which are the types of exposure that would occur in a school setting, did not produce detectable airborne peanut allergen [12•]. Based on this evidence, airborne peanut exposure does not pose a risk to children with peanut allergy, so it does not appear necessary to ban peanut butter from the lunch room.

Proximity Challenge

Occasionally, a family is unsatisfied with reasonable accommodations that the school may offer. Such parents may even bring legal action against a school district. Most of the time, schools will respond by requesting that parents provide a written letter from a physician documenting the need for the extreme measures being requested. When faced by parents or representatives from a school district, it is important to document the actual need for isolation from a food carefully. This may require the student to undergo a proximity challenge to the food.

During a proximity challenge, a student should be exposed to the food of concern by routes that reproduce the type of exposure that the parents are concerned about. To be most useful, a proximity challenge should be performed using a double-blinded method using appropriate controls. For peanut butter, for example, appropriate controls could include other “butters” such as almond, cashew, or sun butter.

Psychosocial Aspects

There is a significant psychosocial impact on children and families due to food allergies. Some children have a constant fear about ingestion and a possible life-threatening reaction. There are emotional burdens because they are not accepted by other people, they are socially isolated, and/or they believe that they are a burden due to their food allergies. Children can also develop anxiety and distress caused by teasing, taunting, or bullying by their peers. All of these concerns and fears can lead to an unnecessary restrictive environment, barriers to learning, and conflicts between families and schools. It is important for schools, families, and health-care providers to encourage children to talk about their feelings and encourage them to speak up for their health and safety. Health-care providers can help the schools and families create a mutual safe school environment (FAME) [13].

Treatment of Reactions

Anaphylaxis Action Plan

A food allergy/anaphylaxis action plan is a document that describes in detail what action should be taken if a student ingests or is suspected to have ingested a food that they are allergic to. The plan should describe symptoms that the student may be observed to be experiencing, how quickly those symptoms are progressing, and what action to take (usually administration of medications) for each symptom or combination of symptoms. Symptoms can range from no symptoms at all to full-blown anaphylaxis. Treatments should be given based on the symptoms that are being experienced. The most common error is that symptoms are overlooked or their severity is unappreciated leading to under- or delayed treatment with epinephrine. It is important for childcare providers and school staff to be aware that prompt administration of epinephrine is imperative when anaphylaxis has occurred.

In a survey of school nurses who worked at schools with at least one student with food allergy (mean of nine students per school), 44 % had an anaphylaxis plan for all of their food-allergic students and 42 % had such plans for only half of their students. Most schools had at least three school personnel who were trained to administer epinephrine [14]. In another study, only 2/3 of schools required anaphylaxis action plans, and 15 % used the action plan provided by the Food Allergy Network [3].

A template for an anaphylaxis action plan can be found on the Food Allergy, Research and Education (FARE) website at <http://www.foodallergy.org>. Figure 1 shows another example of an anaphylaxis action plan that is used at Children’s Mercy Hospital. To be most effective, it is important for the

anaphylaxis action plan to have essential components including emergency contact information, instructions for administering medications, and information about the student's health history.

In addition to FARE, anaphylaxis plans as described above have been recommended for children with food allergy by the Joint Task Force of the American College of Allergy, Asthma and Immunology and the American Academy of Allergy, Asthma and Immunology [15]; the American Academy of Pediatrics [16]; the European Academy of Allergology and Clinical Immunology [17]; and the National Association of School Nurses [18•].

Epinephrine at School

The government has taken several steps in recent years to help schools manage food allergies. In 2011, the FDA created the Food Safety Modernization Act which was designed to improve food safety in the USA by shifting focus from response to prevention. Through this act, the Voluntary Guidelines for Managing Food Allergies was developed and published in October 2013. These guidelines provide practical information for parents, administrators, and staff to develop and/or strengthen school plans for food allergy management and prevention. There are five main priority areas to focus on: (1) ensure the daily management of individual children with food allergies, (2) prepare for food emergencies, (3) provide professional development on food allergies, (4) educate children and families about food allergies, and (5) create and maintain a safe educational environment. These guidelines are available on the CDC website (<http://www.cdc.gov/healthyouth/foodallergies/>).

Students who are old enough should be permitted to carry injectable epinephrine with them while at school (and at other

times as well). Such students should be trained to use their device correctly and to self-administer epinephrine at the first sign of anaphylaxis and then seek medical help. Nonadherence to having epinephrine is a significant problem among these students. In one study, 50 % of food-allergic students were found to have unexpired epinephrine when checked by a school nurse. This improved when they were given periodic reminders throughout the school year [19•].

A survey of 109 school districts in Massachusetts from September 2001 to August 2003 found that epinephrine had been administered 115 times and that 24 % of the time, it was given to treat anaphylaxis in a student not previously known to be food-allergic [20]. In addition, 19 % of the reactions occurred outside of the building on the playground, on a school bus, or during field trips. The average time from onset of symptoms to treatment was 10 min.

Because of this and other surveys, on November 13, 2013, the President signed into law the School Access to Emergency Epinephrine Act. This act encourages each state to adopt laws requiring schools to have "stock" epinephrine. Yet only 43 % of schools continue to report having epinephrine injectors. This rate is even lower in schools with students from predominately lower socioeconomic status [21, 22].

Despite these recommendations, of 271 children with peanut allergy living in Quebec, 4 were not prescribed an epinephrine autoinjector, 48 % of the children did not carry the autoinjector with them at school, and for 78.0 % of those who did have an autoinjector, it was located in the nurse's or another school office [23].

Management of Anaphylaxis

While there is some controversy regarding the precise definition of anaphylaxis, its management is well defined. Students

Fig. 1 An example of an anaphylaxis action plan that can be used in the school

Food Allergy/Anaphylaxis Plan			
ALLERGY TO: _			
Reaction	System	Symptoms	Do the following
No Reaction		• Exposure to allergen but no symptoms	Observe
Mild Reaction	Nose Mouth Skin Abdomen	• Runny nose, sneezing • Itching, tingling or swelling of lips, tongue or mouth • Hives, itchy rash, swelling of face or extremities • Nausea, cramps, vomiting, diarrhea	Give antihistamine and Observe Note: Severity of symptoms can change quickly.
Reaction involves 2 or more systems or it involves:			
Moderate to Severe Reaction	Throat Lung Heart	• Tightening of throat, hoarseness, cough • Labored breathing, wheezing • Fast pulse, fainting, blue skin	Use Epinephrine* and then give antihistamine Call 911
Medications:		*May repeat epinephrine dose in 10 minutes if symptoms have not resolved.	
Antihistamine: Benadryl (diphenhydramine) _			
Epinephrine: Inject into the muscle of the thigh: <input type="checkbox"/> EpiPen <input type="checkbox"/> EpiPen Jr. <input type="checkbox"/> AuvIQ 0.3 <input type="checkbox"/> AuvIQ 0.15			
Emergency Contacts:			
• Name: _____		Relationship: _____	
Home Phone Number: (____) _____-_____		Work Phone Number: (____) _____-_____	
• Name: _____		Relationship: _____	
Home Phone Number: (____) _____-_____		Work Phone Number: (____) _____-_____	
THIS PLAN SHOULD BE FOLLOWED EVEN IF PARENT/GUARDIAN CANNOT BE REACHED			
Signature/Relationship of Person Responsible for Healthcare _____		Printed Name _____ Date _____	

who have a known history of food allergy and who have inadvertently ingested the food of concern should be considered to be at risk for developing anaphylaxis. What is uncertain is whether a student who is suspected to have eaten the food of concern should be observed closely for development of signs and symptoms of anaphylaxis or whether they should summarily be treated with epinephrine prior to exhibiting any manifestations.

Once a student displays signs of anaphylaxis, the treatment is epinephrine [15]. This should be administered prior to any other treatment including antihistamines or corticosteroids. After epinephrine, the student's action plan might also recommend administration of an antihistamine such as diphenhydramine. It is important to recognize that antihistamines have no effect on the course of anaphylaxis so their administration is optional and is given to control symptoms such as pruritis.

Students who have been treated with epinephrine should remain under close observation. The student's parents should be notified that epinephrine has been given, and consideration should be given to calling 911 and requesting emergency services in case the reaction recurs or progresses.

Training of School Personnel

Since most schools do not have a full-time nurse, it is essential for other staff to be trained to identify and treat a food reaction should it occur. Schools should have a plan to respond to a food-induced emergency that necessarily differs depending on the age and maturity of the students [24, 25]. One survey found that school nurses reported a high interest in obtaining educational materials about food allergy, particularly from internet and video sources [26].

In a survey of 237 teachers, 52 % knew which of their students had food allergy. In addition, when asked how they would treat anaphylaxis if it occurred, 24 % said that he/she would give first aid, 40 % would notify the school nurse, and 20 % would call the emergency services. Only 6 % of the teachers reported that there was an anaphylaxis action plan in their school. In addition, 10 % were familiar what an epinephrine autoinjector is, and 4 % knew how to administer it [27].

Management of anaphylaxis, including administration of epinephrine, obviously requires the presence of trained school personnel. Since up to 2/3 of schools have at least one food-allergic child and a severe reaction can even occur at school for the first time in a student not previously known to be food-allergic, it is essential that a critical mass of personnel be taught to recognize the signs and symptoms of anaphylaxis and its management [17]. Teachers should discuss this issue with parents and become familiar with the history of each student's food allergy. A food allergy action plan should be required for each student with food allergy. Epinephrine should be strategically placed in areas of the school where it is immediately available to treat students who may have a reaction. An

emphasis should be placed on having student nonspecific epinephrine autoinjectors near the cafeteria or locations where food is likely to be ingested. Practice anaphylaxis drills should be held periodically to ensure that school personnel are familiar with its identification and treatment [28••].

A number of states have begun to develop and implement policies regarding training of school personnel and requiring parents to provide an anaphylaxis action plan for their children. Washington State developed specific guidelines for school districts that require training of school staff about how to identify and manage students with significant health problems including food allergy [29]. Michigan schools also have begun to develop policies including avoidance strategies that involve no-sharing and food substitution. Some schools also have epinephrine accessible in the classroom, carried by the student or with teachers and other staff who are trained to administer it [30].

Conclusions

With the rising incidence of food allergies in children, it is of utmost importance that the schools, families, and communities are educated and trained on food allergy safety. Previous literature has shown deficiency in both knowledge and preparedness of school personnel. As members of the medical profession, it is important that we properly educate families and schools regarding food allergies. With no current cure for food allergies, avoidance and emergency preparedness are the only forms of management currently available. Recommendations for avoidance should be based on evidence-based scientific research. It is known that serious reactions occur through ingestion, not inhalation or casual contact. Previous literature has also shown that not all students have a plan and emergency medication available. It is vital that health-care professionals and schools work together to make sure all children with a known food allergy be properly prepared with not only a plan and medication but also a medical alert identification. The schools also need to be prepared to treat the child with no previous history of a food allergy. Together, we, as health-care professionals, along with the schools and families, can help create safe learning environment for all children regardless of their food allergies.

Compliance with Ethics Guidelines

Conflict of Interest Jay M. Portnoy declares the receipt of speaker fees from Mylan.

Jodi Shroba declares no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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- Of major importance

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